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ABSTRACT

The purpose of this paper is to suggest an alternative approach to perform relevant and useful evaluations of Web-based learning and instruction (WBLI) that will accommodate performance and keep pace with the growing capabilities of the Internet. Discussion includes the advantages of WBLI, multimedia and streaming use in WBLI, building the foundation of WBLI capability, and a review of WBLI evaluation approaches. The paper focuses primarily on defining an evaluative framework that can accommodate a range of WBLI interventions specifically within a business environment by more deeply exploring learner needs, concerns, and expectations. A case study involving WBLI designed to assist the E-Service solutions group at Nortel Networks implement Time to Market (TTM) development principles is used to illustrate several aspects of the emergent framework. Contains 12 references. (Author/AEF)

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Evaluating Web-Based Learning and Instruction (WBLI): A Case Study and Framework for Evaluation

Greg V. Michalski, Ph.D.

Introduction

The purpose of this paper is to suggest an alternative approach to perform relevant and useful evaluations of web-based learning and instruction (WBLI) that will accommodate performance and keep pace with the growing capabilities of the internet. Rather than focus on the particulars of the many specific techniques and approaches available to simply collect user-supplied data (e.g., using web-based surveys), however, the following discussion is concerned primarily with defining (at least the precursors of) an evaluative framework that can accommodate a range of WBLI interventions specifically within a business environment by more deeply exploring learner needs, concerns, and expectations. A case study involving WBLI designed to assist the E-Service solutions group at Nortel Networks implement Time to Market (TTM) development principles is used to illustrate several aspects of the emergent framework.

Web-Based Learning and Instruction

The evolution of the internet and in particular the World Wide Web (WWW) continues to expand opportunities to deploy WBLI on an unprecedented scale. For example, leading market research firms estimate the optical internet market will grow to $35 billion (US) by 2001.

Industry research shows that WBLI involving multimedia is a cost-effective communication method—a key to travel and traditional training savings that is being used by an increasing number of firms and organizations. For example, in the 12 months following the deployment of its unicast service in 1997, Boeing has enjoyed cost savings on training, productivity, travel avoidance, and tape distribution citing savings from duplicating and distributing videotapes alone totaling $140K/month. Their Unicast service handles 400-500 short video clips on training, announcements, procedures, and so on. It has been receiving 3000-6000 visits per week, serving 20,000 users. Other companies have made similar claims. MCI claimed to achieve $1M in travel reductions within 9 months, while GE information services claims benefits based on time-value of information for marketing, as well as savings to train newly hired employees.

Some commonly cited advantages of WBLI include

- easy version and integrity control of information with global updating capabilities
- provides a highly-accessible means to capture valuable organizational knowledge
- leverages the use of internal organizational networks already in place and familiar to users

Multimedia and Streaming Use in WBLI

The most advanced WBLI applications increasingly incorporate the use of "streamed" video, audio, illustrated graphics, and audio synchronous presentation services onto desktop PCs. Streaming allows users to view video, audio, or enhanced presentation charts while the file is being downloaded.

Two primary types of streaming include *unicast* and *multicast* applications. Unicast is a one-to-one delivery method by which each user is served individually (i.e., the server streams requested files to each user so that 100 requests result in 100 streams). Applications might include shared learning or virtual classroom environments. Many organizations provide primarily unicast service with supplemental "cache servers" in key locations so users can stream their content from the nearest server to enable the highest quality service possible.

Multicast is a one-to-many delivery method in which a single server streams one file to multiple requestors. This streamed file can then be replicated and redistributed by local servers to save bandwidth. Applications might include lectures, presentations, meetings, news headlines and weather updates. Both unicast and multicast streaming techniques rely upon steadily increasing speed and bandwidth which is at the heart of internet growth.

Building the Foundation of WBLI Capability

According to Roth (1998) the doubling capability of the internet every 12 months seems to be following Metcalf's Law. This is named for Robert Metcalf (also known as the father of Ethernet) founder of 3Com Corporation. According to Roth, "Metcalf's Law states that when you connect any number, *n*, of machines, you get *n squared* potential value." (p. 293) By providing the infrastructure for computers to communicate with each other (particularly via the growing internet) their value grows at an exponential rate.

Currently there are a handful of companies that constitute the main players building the actual roadbed or "infostructure" of the so-called information superhighway. Among these, Nortel Networks, has built 32 out of 40 national and pan-European optical networks announced over the past two years globally. These high-

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performance optical internet solutions, include Nortel's OPTera Metro, OPTera LH and the industry-leading 10 Gbps (giga—or billion—bits per second) platform which currently supports as much as 320 billion bits of data per second on a single optical fiber. Future capabilities will allow this system to deliver 6.4 tera (trillion) bits per second on a single fiber. This is notable because in the mid 1990s all the phone networks in the world combined carried only an average of 1 tera bit per second. Two tera bits is equivalent to all the voice traffic in North America switched and routed each second. This transfer rate would allow the entire contents of the U.S. Library of Congress to be transmitted across the country in approximately 20 seconds.

Optical business is growing rapidly as service providers (e.g., telecommunications access providers) race to meet explosive demands for bandwidth driven by the internet and growth in electronic business (e-business). These networks are the foundation for the high-performance internet that will continue to deliver increased speed, reliability, quality and new economics for information exchange and distance learning applications such as WBLI.

Against this dynamic backdrop of growing capability the design, deployment, and evaluation of WBLI is also changing. As outdated approaches using the internet mainly to deliver largely passive online slide shows become replaced by the more sophisticated multimedia presentations that include the streamed applications mentioned as well as real-time interactive audio and video communications capabilities, the capability and capacity to evaluate WBLI will also grow.

WBLI Evaluation Approaches: A Brief Review

Several methods and approaches to evaluating web-based training have been described in the literature. For example, Hall (1997) discussed ten main criteria used for semiannual judging of the Multimedia and Internet Training Awards (MITA). These include (1) content, (2) instructional design, (3) interactivity, (4) navigation, (5) motivational components, (6) use of media, (7) evaluation, (8) aesthetics, (9) record keeping, and (10) tone.

Within these ten criteria content refers to the appropriateness, amount, and quality of the basic information included in the training. Instructional design focuses on the assembly of the information in such a way so as to promote participant learning. Navigation refers to the steps taken and the accommodations made to allow users to effectively guide themselves through the content of the instruction. This involves considerations of the presence of a course map as well as appropriate use of labels and icons for navigation of the site. Motivational components include elements to engage users through the use of novelty, humor, adventure, surprises and so on. These are the traditional WIIFM (what's in it for me) elements included in all well-designed instruction. Use of media involves the effective and appropriate use of graphics, animation, and multimedia in general. Aesthetics refers to what might be alternately termed the "face validity" of the instructional site. This involves judgments about how credible, attractive and visually appealing the instruction is to the visual and auditory senses. Record keeping involves data management considerations about how any user/learner performance data are routed and ultimately used. Tone refers to the degree to which the learning program is appropriate for its intended audience.

The MITA criterion labeled evaluation focuses on user/leaner performance on some predetermined exercise intended to examine learning or mastery of a topic or series of related topics. According to Hall (1997) evaluation evidence might include user/learner completion of a simulation or quizzes, tests, and examinations intended to probe learner knowledge related to the training. As will become apparent shortly, many WBLI and distance learning evaluation efforts focus almost exclusively on knowledge testing.

While these ten criteria emphasize primarily the technical aspects of the instructional web site, others have taken a somewhat broader view by including considerations of both the technical and human infrastructure associated with web-based instruction. In addition to instructional and web-site design, McGreal (1997) includes considerations of roles and responsibilities of several participant groups including instructors, tutors, as well as learners. According to McGreal (p. 70) "You can never make the respective roles and responsibilities of the teacher tutors, and students too clear." In connection with defining such roles, questions related to control of the development and deployment of web-based instruction were posed. These ask respectively about the control of course development (e.g., individual, cooperative, open, teams, contracted out, specialists) and the control of the deployment (e.g., self-paced, tutorial, deadlines, scheduled labs, live class sessions).

Other authors have emphasized several dimensions of learner evaluation related to WBLI. In describing networked learning environments, Chute, Sayers, and Gardner (1997) stated that a course evaluation system should be designed to provide testing results quickly to learners. In addition these authors emphasized the important role of support services designed to facilitate and assist learners in successfully completing a given instructional module. Beyond traditional individualized learner tests and quizzes, however, these authors also pointed out that collaboration on quizzes "can be a very

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positive learning activity." (p. 79) This is because when several learners collaborate they are interacting in a manner that would not have taken place using a traditional (individualized) quiz scenario. Through such collaboration learners are exposed to other viewpoints of a subject, thus enhancing group-level learning.

Several authors have discussed the evaluation of distance education as a more general enterprise that includes a range of delivery technologies in addition to WBLI. In defining and applying program evaluation principles to the evaluation of distance education Simonson (1997) differentiated between theory-based research and evaluation noting that evaluation (contrasted to research) is the "systematic investigation of the worth or merit of an object." (p. 88) In further drawing upon the (1994) Joint Committee on Standards for Educational Evaluation, Simonson noted that program evaluation is the systematic investigation of the worth of an ongoing or continuing distance education activity. This author also reviewed two approaches to distance education evaluation based upon principles of program evaluation.

Referencing prior work by Woodley and Kirkwood (1986), Simonson outlined six categories of evaluation information that can be collected about distance education programs. The first category includes measures of *activity* which include counts of events, people, and objects (often available from administrative records). Typical counts might include the number of courses produced, the number of students enrolled, or the number of applicants for a particular program. The second category contains measures of *efficiency*. Such measures could include data pertaining to the number of students successfully completing the course, average student workloads, the number of students enrolled in related courses, and course costs and revenues (as tuition generated). The third category describes measures of *outcomes* related to student learning. In addition to test scores, student interviews and surveys can be used as well as more indirect measures, for example, the documentation of the use of courses and course materials by other institutions. The fourth category includes measures of *program aims* which might examine data about the scope and demographic characteristics of learners reached by the program. The fifth category involves measures of *policy*. Policy evaluation often resembles market research focusing on surveys of prospective students and employers. But policy evaluation can also be used to determine the success of experimental programs as well. The sixth category includes measures of *organizations*. This involves monitoring program effects related to organizational efficiency. This can be accomplished through site visits and selective interviews people in the organization.

Another approach useful to evaluate distance learning programs is based on an examination of five key areas that include *accountability*, *effectiveness*, *impact*, *organizational context*, and *unanticipated consequences* (AEIOU). Within this approach accountability examines whether the project planners did what they promised. Measures of this might include monitoring the number of students who enrolled in or otherwise engaged a program. Interviews of program or project staff as well as project administrative records provide a good source of accountability information. Effectiveness refers to the quality of the overall project especially in terms of participant attitudes and knowledge. Grading, testing, and attitudinal inventories can all provide measures of effectiveness. These might include standardized measures of achievement as well as participant perceptions of the program. Impact measures whether the project made a difference. Here the focus in on any changes that can be linked directly to the project. Methods appropriate to monitoring impact can be either qualitative (interviews, focus groups, direct observations) or quantitative (surveys, standardized test scores, participant record data). Organizational context examines which structures, policies, or events in the organization or environment helped or hindered the project in accomplishing its intended goals. Here attention is paid particularly to which factors helped or hindered the implementation of a project. Unanticipated consequences refer to any unexpected or unplanned changes (either positive or negative) that occurred as a result of the project. These may be described in terms of anecdotal information emerging from interview, focus group, journal, or survey data collected after the learning program (*ex post facto*) or WBLI event. The following case example includes the use of both quantitative (survey) and qualitative (focus group) techniques to assess learner perceptions and expectations of a web-based instructional course.

A Case Example

This case example describes the evaluation of a WBLI intervention designed to promote TTM processes within an E-service group at Nortel Networks. The E-service group (at the time this article was written) consisted of 27 regular, full-time employees. The vision of this group is to provide unified processes and systems enabling web-based customer network/business service and support. The group's supporting mission is to give customers and service personnel consistent, simplified, web-based processes and systems that reduce costs, drive revenues, and enhance customer satisfaction. The goals of the E-service group are to decrease the cost of service, reduce the cost of product ownership, and improve customer problem resolution through self-service (web-based) mechanisms designed to increase the speed of business transactions. E-service also aims to facilitate knowledge

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transfer to both internal and external clients and customers, drive revenues by "upselling" services and linking to product sales, and increase customer loyalty and retention. Common E-service elements include case and knowledge management using a common infrastructure to mitigate vendor risk (e.g., key word search, FAQ, status tracking), documentation access, and "searchability" providing a single interface to customers with seamless access. Key services and capabilities include asset tracking, repair and return as an on-line process, software delivery (tied in with order management), incremental (patch/fix) updates, beta software, real-time updates, and other information delivery such as hardware baseline files, bulletins, bar code lists, and metrics (e.g., customer satisfaction, usage statistics, service revenues, entitlement information, chat rooms, and product access/simulation. Although the E-service group from its inception has operated in a managed project environment, its early recognition of the benefits of adopting a formal TTM approach led it to seek formal instruction in this area. Before describing E-service's experience, however, the following section provides a brief overview of TTM and its key principles.

Time to Market (TTM)

With the onset of the internet age and the dawn of e-business the speed in which products are developed and delivered to market has become critical. Accelerating delivery of the right product to market is a requirement to compete in the data world of short cycle time and is critical to achieving success and enhanced competitiveness.

Beginning in the mid-1990's several bench marking studies indicated that it took companies such as Nortel more that double the time to introduce new products to market than so-called best in class companies. However, additional studies and empirical evidence also indicated that time to market improvements of 40% to 60% were achievable by introducing a disciplined product development processes (TTM) into business units (see additionally, e.g., Gates, 1999; Harreld, 1994; McGrath, 1995; Meyer, 1993). The overall TTM project objective was to cut Nortel's new product development cycle time in half. This project was aimed at all business units seeking dramatic reductions in time to market for both products and services. Such reductions would offer significant earnings potential driven through research and development (R&D) efficiency, reductions in wasted R&D spending, increased revenues (first/early to market) and improved product margins.

ITM was fully deployed to all business units throughout 1999, with the expectation that all business units would be self-sustaining (no longer require training and facilitation from the core team) by the end of 1999. To date nine major business units have engaged TTM processes with all business units scheduled to initiate the formation of project teams. Metrics were implemented to track project progress and its impact. During the year 2000, a small TTM core team of best in class process experts will facilitate an executive TTM council and a TTM practitioner council to ensure that ongoing cross business unit collaborative meetings happen, and that a common TTM framework is maintained and continuously improved.

TTM BUSINESS CASE: Early estimates indicated that the reduction of new product development cycle time by 50% would generate significant benefits in several areas including financial as well as shareholder, customer, and employee value. Improved financial results would come from increased profitability through improved R&D efficiency and productivity reinvestment to decrease development cost and increase revenues. Improved product margins would also result from being early to market by achieving price premiums and getting a jump on cost reductions as well as the reduction of wasted R&D spending through managed project cancellations based on market and customer needs. Shareholder Value improvements realized through TTM will lead to a more responsive, customer focused company with improved earnings potential. TTM impacts customer value by facilitating delivery of the right combination of products and features. Higher quality and timely delivery are driven by more extensive customer involvement which fosters greater customer loyalty. TTM impacts employee value by promoting empowered integrated project teams operating with efficient resource utilization and reassignment as well as integrated design and rationalized toolsets to generate better skill attraction and retention and, ultimately, greater employee satisfaction.

The TTM process also contains a number of key assumptions. There involve the following five areas

- Cycle Time—Cycle time reduction of 50% (from 18 month average product development cycle time to 9 month average)
- Earlier Market Delivery—9 months early revenue for new product introductions; 10% additional revenue for product life on new product introductions; 5% increase in product margins for new product introductions
- Development Productivity—50% reduction in cycle time equating to a 20% productivity improvement in new product development
- Wasted Development Spending—5% development cost savings in '99; 6% in 2000; 7% in 2001
- Timing—benefits are built on a phased deployment plan to engage all business units by end of 1999; 50% of business unit development projects impacted in first cycle; development

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projects receive 75% of benefits in first cycle; All projects impacted in second cycle with 90% of benefits

TTM PROCESS MODEL: TTM consists of five basic elements, each depending on the other for maximum impact. These include the establishment of several teams including a Portfolio Management Team (PMT) and core teams. Other process elements include the definition of Business Decision Points (BDP), a Structured Development Process, and Integrated Enablers. These elements are depicted and briefly described next as illustrated in Figure 1.

The structure of each core team is tailored to the needs of the specific project. The extended core team is a broad membership of representatives from all functional organizations that serve the core team for the particular project. Members of the extended core team receive daily project direction from the core team member representing their function, and, receive technical direction and daily administrative management from their functional manager. Business Decision Points (BDP) are the mechanism by which the PMT reviews, approves, and allocates resources to product development projects.

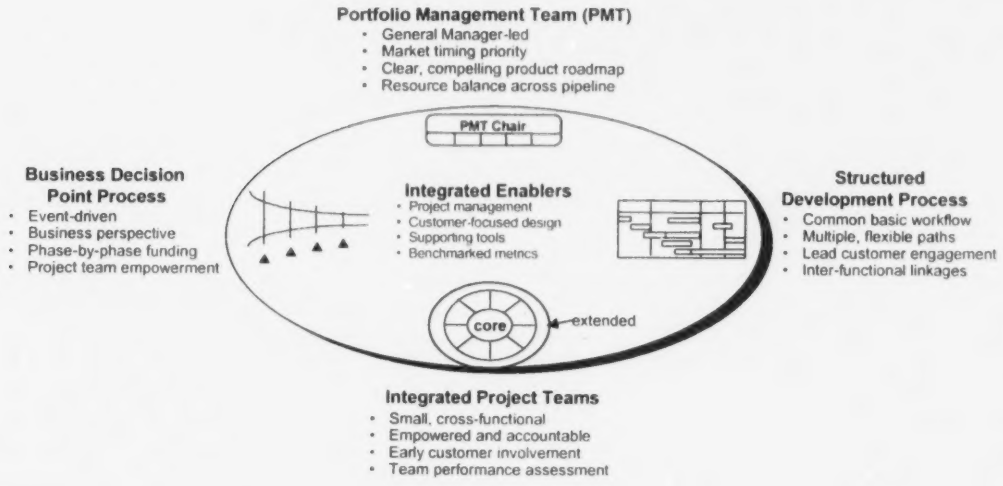

Figure 1. TTM Process Model.

The *Portfolio Management Team* (PMT) is the team of cabinet-level managers responsible for overseeing the pipeline of new product development efforts and committing the resources necessary for effective execution. The PMT is guided in its decisions by strategic and financial goals and must constantly balance the needs of multiple development projects at various phases in the development process. Through business decision points, the PMT empowers core teams to develop and deliver new products.

Integrated Project Teams (IPT) are cross-functional teams with full responsibility and authority for executing projects. Each IPT is further divided into the core team and the extended core team. The core team drives decisions and activities from concept approval through stable production, and its limited membership (4-8 people) represents and drives all functional resources involved throughout the phases of product development. Core teams are approved by and accountable to the PMT.

BDPs are conducted from a business perspective and provide the PMT with the appropriate information to make decisions regarding the continuance, redirection, or cancellation of projects.

The *Structured Development Process* maps the path that all projects take in progressing from initial concept through general availability. For explanatory purposes, this path is organized in a hierarchy of phases, steps, activities, and tasks. The intent of the structured development process is to help core teams successfully plan and manage product development projects. Additionally, the process guides core teams in completing each successive phase and presenting salient business issues to the PMT.

Integrated Enablers provide core teams with tools and functional techniques to engage customer input, plan projects, and manage risks. For example, Customer Focused Design (CFD) is a methodology integrated into

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TTM. Its purpose is to provide tools that lead to greater understanding of key customer requirements, which are then incorporated in the solution design. Other important enablers include metrics management, decision-making tools, human resources processes, budgeting processes, and so on.

In summary, TTM works because all product programs are managed as end-to-end projects with each project having an end-to-end accountable leader. Cross-functional teams have the project's business success as their only objective, and individuals identify with the project not with their function. TTM also ensures that all project plans are customer focused. Each project has a charter defining priorities, desired outcomes, and timeframes. The product delivery process uses Alpha-Beta terminology and each project defines Alpha-Beta in its own context. The general managers and their cabinets are responsible for project starts, stops, and release to market based on business needs. TTM also involves strong executive-level support in which general managers are completely on board and personally driving change based on customer, market, and business requirements.

Evaluating Web-Based TTM Instruction for E-Service

The principles and processes associated with TTM were captured in a self-paced, interactive, WBLI module that also incorporated multimedia (audio/video) components. This module was prepared as a general introduction to TTM and was also used by other corporate groups and individuals as a means to become quickly oriented to the basics of TTM.

Rather than simply direct E-Service employees to the web site containing the TTM module, however, employees were instead directed to complete a pre-engagement (web-based) questionnaire designed to capture demographic, background, and expectations information about E-Service employees engaging TTM instruction. The questionnaire contained three main sections. The first of these contained a series of questions inquiring about employee background and interest in TTM as well as an item to probe learner expectations of the TTM web-based instructional module. Sample items from this section include the following:

I am engaging this Time to Market (TTM) presentation because... (choose one or more):

- ❑ I want to improve my general knowledge about TTM.
- ❑ I want to avoid having to attend a traditional, classroom-based, course on TTM.
- ❑ I am just curious about TTM.
- ❑ I am just curious about the website.
- ❑ I was encouraged to do so by a co-worker (peer)
- ❑ I was encouraged to do so by my manager
- ❑ (of) another reason (please describe below)

After completing this presentation I expect to be able to... (choose one or more):

- ❑ Describe basic TTM concept/principles
- ❑ Answer basic questions about TTM
- ❑ Understand how TTM supports Nortel business goals
- ❑ Understand how to apply TTM knowledge to my job
- ❑ Apply what I have learned on the job
- ❑ other (please describe below)

My level of knowledge about Time to Market (TTM) is... (choose one):

- ❑ This is the first time I have heard of TTM.
- ❑ I have heard of TTM but know extremely little about it.
- ❑ I have heard of TTM and I know some its basic concepts/principles.
- ❑ I have a working knowledge of TTM.
- ❑ I have an extremely high degree of knowledge about TTM.

My level of interest in learning more about TTM is... (choose one):

- ❑ low
- ❑ moderate
- ❑ high

Section two of the questionnaire inquired about learner preferences regarding media. Each respondent was asked to rate a list of learning methods/media in terms of how strongly he or she agreed (using a 5-point Likert scale) with it as a preferred means to learn. This list included the following 12 items:

traditional classroom
audio tape
video tape
CD-ROM (multimedia presentation)
web/internet based (multimedia presentation)
electronic performance support system (EPSS)
traditional printed media (books, manuals, etc.)
radio broadcast
television broadcast
satellite based (interactive multimedia)
desktop (interactive) videoconferencing
audio conferencing by phone

The third main section of the pre-engagement questionnaire inquired about learner background and demographic characteristics such as job role (manager, non-manager, hierarchical level within specialization, and so on), line of business, age category (in 5 year increments from 20 years through over 55 years of age), and highest academic degree achieved (non-degree, bachelors, masters, doctorate, and other specialized degree).

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This information was collected as a pre-assessment of specific learner background characteristics, expectations, and experiences regarding TTM especially with the context of their work group. While a detailed analysis and discussion of the results obtained for the E-Service is beyond the scope of the current paper, the reader is directed to Michalski (2000) for such a discussion involving a larger group sample using the survey items described above. The following section discusses the results of two focus groups involving both E-Service management and non-management employees within the E-Service group.

Focus Group Results

Although results from the pre-engagement instrument were analyzed and reported to E-Service management regarding the expectations and readiness of their employees to engage TTM WBLI, two separate focus groups (facilitated by the author) were performed to more completely investigate and understand these results. Each session was implemented as a half-day (4 hour) meeting among E-Service personnel.

The first of these sessions involved E-Service management and consisted of a total of 9 individuals. Having reviewed the TTM web-based instruction, this group was primarily interested in the business benefits promised by TTM. Discussion centered around topics such as which other groups had adopted TTM and what has been their experience with the process, as well as the mechanics of TTM implementation specifically within the context of their highly specialized group. Typical questions raised and discussed included

- *What other groups have already adopted TTM?*
- *What has been the experience of these groups?*
- *How has TTM assisted these groups in more effectively accomplishing their goals and business objectives?*
- *What level of resources and expenditures were required to effectively implement TTM?*
- *What type of instructional and documentation support was available during the implementation of TTM?*

Judging from focus group discussions, this group of managers was obviously "sold" on the idea of TTM and sought largely to understand how to best manage the implementation of TTM for the employees in their group.

The second focus session involved a larger number of predominantly non-management E-Service employees. These were mostly people with highly specialized technical expertise related to, for example, web-based design and data management, product sustaining and support, customer service, marketing, and various other non-managerial roles.

In contrast to the managers participating in the first focus session, this group was much less "sold" on the idea of TTM. Even having engaged the TTM web-based instruction (as had the managers), individuals in the non-management group had far more questions related to the necessity of adopting and, hence, needing to learn about TTM in the first place. Typical questions discussed by this group included

- *How does TTM differ from basic project management?*
- *What would need to be actually done differently by employees to effectively practice TTM?*
- *Has the adoption of TTM been "mandated" by upper management?*
- *What might be the consequences of not adopting TTM?*
- *What types of metrics were available to monitor their group's progress on adopting TTM?*

Overall, this group was much more reserved and reluctant to open up and share their views. This situation required substantially more effort on the part of the facilitator to try to develop the group's level of discussion about TTM. Toward the end of the session (in the last 45 minutes or so) the group finally did open up more posing the following specific comments/questions/concerns:

- *What are the specific roles and responsibilities of employee relative to TTM?*
- *What TTM tools were available?*
- *Was there a way to "quick-start" the TTM process in the group that would avert the need for specialized training on the subject?*
- *What were the "next steps" involved in adopting TTM?*
- *What were the implications of adopting TTM in a program-based (E-Service) versus project-based business environment?*

By the conclusion of both focus group sessions it was obvious that there were several areas of employee concern that were not previously anticipated. Knowing this, the performance of a simple *ex post facto* evaluation of the TTM WBLI (e.g., using knowledge testing and satisfaction measures) would have clearly yielded misleading results especially based on the employee skepticism described above. Using these results the following section proposes an approach to evaluating WBLI that specifically considers stakeholder group differences and uses data describing these as an input for effective decision making regarding the merit and worth of web-based instruction within an emergent framework.

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Toward an Evaluation Framework for WBLI

The case example presented makes it clear that WBLI evaluation involves a hybrid of organizational, human, and technological factors which all combine to influence learning and ultimately performance. Yet most current models of distance learning evaluation in general, and web-based learning in particular, tend to ignore, diminish, or overlook the complex interrelationships between these factors. In many cases this oversight occurs because of the over reliance on a few well-worn measures especially knowledge testing and satisfaction surveys. Yet such an over reliance can easily set the stage for the presence of untested or even unstated assumptions regarding the true benefit and role of WBLI in a given contextual setting.

evaluation in a more centralized position that examines the effects of a WBLI intervention within a specific contextual human/organizational and performance setting. Such a view places equal emphasis on several aspects affecting performance in addition to formalized planned learning.

The case example provided supports this emergent framework because, although the TTM WBLI involved might be considered both efficient and effective viewed apart from the organizational and performance context, the focus group results revealed that—regardless of the intrinsic quality of the WBLI itself—the application context provided a potent influence in the success or failure of the instruction. Simple evaluative indicators

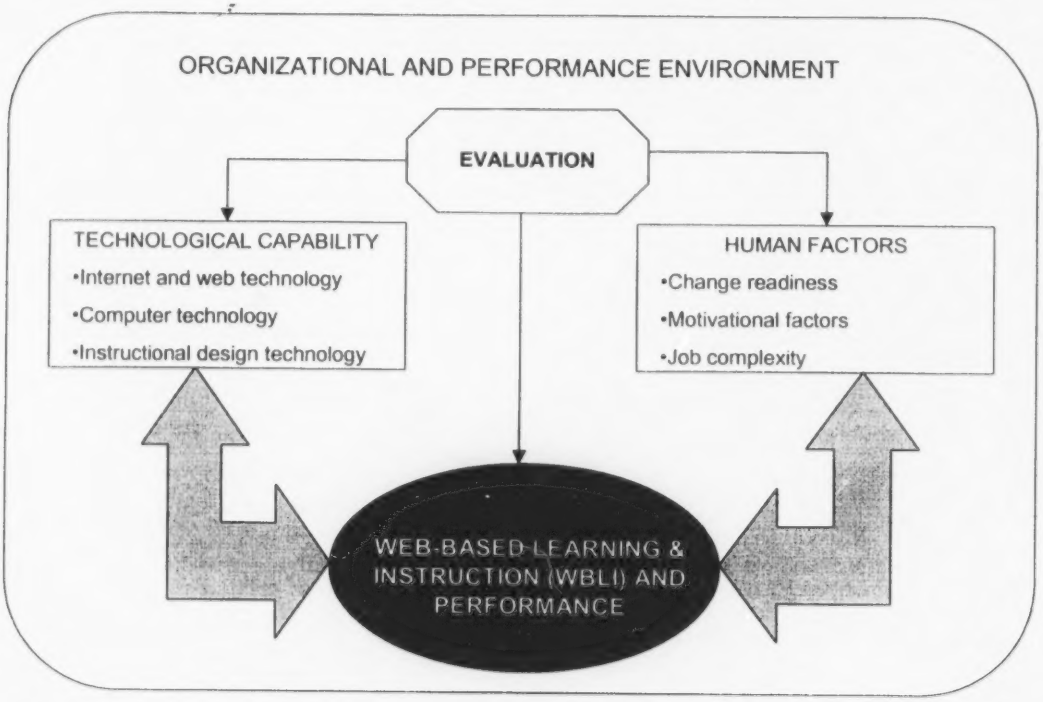

Figure 2. A Framework for Evaluating WBLI.

Based on the literature reviewed and the findings of the case example described, Figure 2 depicts several elements of an emergent evaluative framework that can be used to make explicit the presence of, and relationships among the technological, human, and organizational factors affecting the evaluation of WBLI.

This framework includes a balanced view of WBLI as it is influenced by the steadily emerging (internet and other) technologies as well as the human and organizational context in which these are applied. Rather than make any given piece of instruction (web-based or otherwise) the central focus or unit of analysis, the framework casts

such as pre/post engagement surveys and even assessments of learning (e.g., embedded quizzes, tests, examinations) cannot be relied upon as definitive evidence of WBLI merit and/or worth because these cannot sufficiently accommodate the organizational and contextual job performance environment within which learned knowledge is applied.

This is further substantiated by the evidence produced by several relatively recent empirical studies that point to the critical importance of taking differences in stakeholder perceptions of training squarely into account as part of the overall evaluation process (see, e.g., Brown, 1994;

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Michalski, 1999; Michalski & Cousins, 2000). In sum, the evidence from such studies (along with the case example discussed) support the emergent framework proposed in further suggesting the need to take a closer look at organizational factors as well as stakeholder group differences relative to the evaluation of WBLI.

Conclusions

This paper has examined the evaluation of web-based learning and instruction using a wider scope than is typically applied. The literature reviewed and the case example provided serve to substantiate the emergent evaluation framework which highlights and underscores the importance of human/organizational context as well as the technological capabilities available for developing and deploying WBLI. Although evaluative measures can be either quantitative or qualitative, the evidence suggests that a range of both type of measures are required to get an accurate view of the learning and performance landscape in any given organizational setting.

Finally, instead of attempting to define a generalized framework to evaluate all WBLI, the emergent framework should be viewed as a beginning, rather than an end. It is certainly subject to improvement based on further evidence and learning. As the profound changes associated with advancing communications technology become increasingly apparent to even the casual observer, it is important that evaluation approaches, processes, and techniques continue to also evolve. Empirical work and shared learning based on such work holds the key to the future in this developing area. The continued investigation of WBLI evaluation, particularly within a range of organizational and contextual settings, is truly an area ripe for continued exploration.

Author Biography

Greg V. Michalski is a project manager specializing in employee and organizational learning development and evaluation at Nortel Networks. Dr. Michalski holds multiple advanced degrees (M.S., M.A., Ph.D.) including an M.A. in Educational Leadership/Human Resource Development from Western Michigan University, and a Ph.D. in Education (measurement, evaluation, and administration) from the University of Ottawa. Dr. Michalski also has over ten years of experience in corporate training and distance learning development. He has authored or co-authored a range of articles related to training and learning evaluation, web-based instruction, and performance improvement. He is an active member is several professional organizations including the *International Society for Performance Improvement* (ISPI), the *American Evaluation Association* (AEA), and the *American Educational Research Association* (AERA).

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